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Factors Contributing to Prolonged Length of Stay in the Emergency Department: A 2023 Study from Imam Khomeini Hospital, Urmia, Iran

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Abstract

Introduction: Prolonged length of stay (LOS) in the emergency department (ED) is one of the major operational challenges faced by healthcare systems worldwide. Extended ED stays contribute to delays in diagnosis and treatment, increased patient morbidity, inefficient utilization of resources, reduced quality of care, and substantial financial burdens on hospitals. Identifying the determinants of prolonged LOS is essential for optimizing patient flow and improving the efficiency of emergency services. Given the limited evidence from Urmia, this study aimed to determine the characteristics and contributing factors associated with prolonged LOS in the ED of Imam Khomeini Hospital (RA) in 2023.

Materials and Methods: This cross-sectional study was conducted throughout 2023 in the ED of Imam Khomeini Hospital (RA), Urmia, Iran. A LOS exceeding 6 h was defined as a prolonged stay. Data were obtained from patient medical records and documented using a structured researcher designed checklist. Variables included demographic characteristics, triage level, time of presentation, prehospital emergency report, initial diagnostic procedures, specialist consultation, and final ED disposition. The data were analyzed using Chi square test, independent t-test, one way analysis of variance (ANOVA), and the Kruskal–Wallis test in SPSS software (version 18).

Results: Among 21,301 ED visits in 2023, 203 patients with LOS (>6 h) were included in the analysis. The mean age of patients was 47.3 years, and 59.6% were male. The highest proportion of patients was observed in the 41–60 year age group (P=0.013). Most patients were classified as triage level 2 (80.3%), which showed a significant association with prolonged stay (P=0.001). Prolonged stays were more frequent during the night shift (42.9%; P=0.008), while the distribution across days of the week was not statistically significant (P=0.080). Diagnostic or laboratory procedures were performed for 93.1% of patients and specialist consultations for 16.2% (P=0.001). Ultimately, 50.2% of patients were admitted, while 30% were discharged from the ED, with no significant association between disposition and prolonged stay (P=0.492).

Conclusion: Prolonged LOS in the ED was associated with nighttime workload, higher triage acuity, and the need for extensive diagnostic and management processes. Enhancing access to specialist consultation, strengthening diagnostic resources, and improving patient flow systems may contribute to reducing prolonged ED stays and improving the overall quality and efficiency of emergency care.

Key words: Emergency Service, Hospital, Length of Stay, Patient Admission, Triage

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Introduction

Prolonged emergency department length of stay (ED LOS) is widely recognized as an important indicator of ED performance and overall hospital efficiency. The ED LOS is defined as the time interval from a patient's arrival at the ED until discharge, admission to an inpatient ward, or transfer to another healthcare facility. In many studies, a stay exceeding 6 h is considered prolonged and is used as a benchmark for evaluating the quality and efficiency of emergency care services (1, 2).

Prolonged ED stays have important clinical, organizational, and economic consequences for healthcare systems. Previous research has shown that extended stays in the ED are associated with delays in diagnosis and treatment, reduced quality of care, increased healthcare costs, and a higher risk of complications and mortality (3-5). Evidence suggests that prolonged ED LOS may significantly increase the risk of adverse clinical outcomes, including hospital-acquired infections and mortality. Furthermore, longer stays can contribute to ED overcrowding, inefficient use of healthcare resources, and decreased patient satisfaction (6-8).

Several factors influencing ED LOS have been identified in previous studies conducted in different countries. System-related factors such as ED crowding, limited hospital bed capacity, delays in patient transfer to inpatient wards (boarding), shortages of healthcare personnel, and delays in diagnostic or consultation services are among the most frequently reported causes of prolonged stays (9-12). In addition, patient-related factors, including disease severity, higher triage acuity levels, presence of chronic comorbidities, and the need for advanced diagnostic procedures have also been shown to significantly increase ED LOS (13-15). Operational factors such as the time of patient presentation, particularly during night shifts when staffing levels and access to diagnostic services may be reduced, can also contribute to longer stays in the ED (16, 17).

Despite the increasing number of international and national studies on ED crowding and prolonged LOS, limited evidence is available regarding the specific determinants of prolonged ED stays in the city of Urmia, Iran. Imam Khomeini Hospital is one of the largest referral hospitals in the region and serves a large population from both urban and rural areas. The high volume of patient visits, combined with operational and resource constraints, may increase the likelihood of prolonged stays and overcrowding in the ED. Identifying the factors associated with prolonged ED LOS in this hospital is therefore essential for improving patient flow, optimizing the use of available resources, and enhancing the quality and efficiency of emergency care services.

Accordingly, the present study was conducted to determine the characteristics and factors associated with prolonged LOS among patients in the ED of Imam Khomeini Hospital in Urmia in 2023.

Materials and Methods

Study Design

This descriptive–analytical cross sectional study was conducted in the ED of Imam Khomeini Hospital in Urmia, Iran, during 2023. It aimed to identify the factors associated with LOS among patients presenting to the ED. Imam Khomeini Hospital is among the major referral hospitals in the region and receives a high volume of patients from both urban and rural areas.

Participants

The study population included all patients who visited the ED during the study period. A census sampling method was used; therefore, all eligible patient records in 2023 were reviewed and analyzed. Patients with complete medical records containing the required study variables were included in the study, while those who were discharged against medical advice (AMA) or had incomplete medical records with missing essential information were excluded.

Sample Size

A census sampling method was applied and all eligible patients who visited the ED of Imam Khomeini Hospital in Urmia during 2023 were included in the study. After applying the inclusion and exclusion criteria, a total of 203 patients with an ED LOS longer than 6 h were included in the final analysis.

Data sources/ measurement

In this study, LOS in the ED was operationally defined as a stay of more than 6 h from the time of patient admission to the ED until discharge, hospital admission, or transfer to another healthcare facility. Data were collected retrospectively using a structured checklist developed according to the study objectives. The checklist included demographic characteristics (age and sex), visit characteristics such as the day and time of

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admission, triage level, diagnostic procedures performed during the ED stay (e.g., laboratory tests and imaging studies), consultation requests with different medical specialties, and final patient outcomes, including discharge, hospitalization, or referral. All required data were extracted from patients' medical records and ED documentation by the research team after careful review of the records to ensure the accuracy and completeness of the information.

The study protocol was approved by the Ethics Committee of Urmia University of Medical Sciences. Due to the retrospective nature of the study and the use of existing medical records, the requirement for informed consent was waived. All patient information was kept confidential and analyzed anonymously.

Statistical Analysis

After data collection, the data were entered into SPSS software (version 18) and analyzed using descriptive statistics, including frequency, percentage, mean, and standard deviation. Inferential statistical analyses were also performed to examine the relationships between variables. These analyses included the Chi square test, independent t test, one way analysis of variance (ANOVA), and the Kruskal–Wallis test when appropriate. A P value of less than 0.05 was considered statistically significant.

Results

A total of 203 patients with an ED LOS exceeding 6h were included in the study. Based on the operational definition of the study, all patients had a prolonged stay.

The demographic and clinical characteristics of the study population are summarized in Table 1. Of the total participants, 59.6% (n=121) were male and 40.4% (n=82) were female. As illustrated in Table 1, the most frequent age group was 41–60 years (29.6%), followed by 21–40 years (27.6%). Regarding clinical acuity, the majority of patients were classified as triage level 2 (80.3%), while 19.7% were categorized as level 1. In terms of residence, 59.6% were urban residents and 38.9% were from rural areas (Table 1).

The distribution of ED visits and the services rendered are presented in Table 2. The highest frequency of visits occurred on Tuesdays (18.2%), whereas the lowest was recorded on Fridays (9.9%). Regarding the time of presentation, the largest proportion of patients arrived during the night shift (42.9%), followed by the morning (29.6%) and evening (27.6%) shifts (Table 2).

As shown in Table 2, diagnostic or laboratory procedures were performed for 93.1% of the patients. Furthermore, 16.2% of the participants required specialty consultations during their stay (Table 2). Regarding the type of admission, 50.2% were admitted to inpatient units, while 49.8% were kept under observation in the ED (Table 2).

The final disposition of the patients is detailed in Table 2. The most common outcome was admission to hospital wards (50.2%), followed by discharge from the ED (30%; Table 2). Additionally, 15.8% of the patients were discharged AMA, and 3.9% absconded (left without notification; Table 2).

Table 1. Demographic and Clinical Characteristics of Patients with Prolonged Stay Among Study Participants.

Variable	Subgroup	Frequency	Percentage	*P*-value*
Gender	Male	121	59.6	0.05
	Female	82	40.4	
Age Groups	Under 20	24	11.8	0.013
	21–40	56	27.6	
	41–60	60	29.6	
	61–80	50	24.6	
	81–100	13	6.4	
Triage Level	Level 1	40	19.7	0.001
	Level 2	163	80.3	
Place of Residence	Urban	121	59.6	0.047
	Rural	79	38.9	
	Unspecified	3	1.5	

* Chi-square test

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Table 2. Visit Characteristics, Provided Services, and Final Outcomes of the Study Participants.

Variable	Subgroup	Frequency	Percentage	*P*-value*
Days of the Week	Saturday	30	14.8	0.080
	Sunday	32	15.8	
	Monday	32	15.8	
	Tuesday	37	18.2	
	Wednesday	28	13.8	
	Thursday	24	11.8	
	Friday	20	9.9	
Work Shifts	Morning Shift	60	29.6	0.008
	Evening Shift	56	27.6	
	Night Shift	87	42.9	
Availability / Status	No	170	83.8	0.001
	Yes	33	16.2	
Diagnostic and Laboratory Procedures	No	14	6.9	0.001
	Yes	189	93.1	
Admission Type	Under observation	101	49.8	0.918
	Admitted	102	50.2	
Emergency Department Disposition	Discharged	61	30	0.492
	Admitted	102	50.2	
	Discharged Against Medical Advice	32	15.8	
	Absconded	8	3.9	

* Chi-square test

Discussion

Prolonged LOS in the ED remains a major challenge for healthcare systems because it contributes to overcrowding, reduced quality of care, and increased workload for healthcare staff. Previous studies have shown that ED crowding and prolonged stays are associated with delayed treatment, reduced patient satisfaction, and adverse clinical outcomes (6, 18, 19). Understanding the characteristics of patients who experience prolonged stays can therefore help hospitals improve patient flow and optimize ED performance.

In the present study, most patients with prolonged ED LOS were middle aged and male. Similar demographic patterns have been reported in several studies, suggesting that middle aged adults frequently present with complex medical conditions requiring multiple diagnostic evaluations and clinical decision making (20, 21). Although many international studies emphasize older age as an important contributor to prolonged ED stays, the higher proportion of middle aged patients in the current study may reflect the demographic characteristics of patients visiting this ED.

Regarding clinical acuity, the majority of patients with prolonged stays were classified as triage level 2. Previous research has shown that patients with moderate to severe conditions often require closer monitoring, more extensive diagnostic testing, and longer clinical evaluation, which may increase their LOS in the ED (4, 22). This observation is consistent with findings from other emergency care studies indicating that clinical complexity is an important contributor to delays in patient flow.

Operational factors within the ED may also influence prolonged ED stays. In the present study, a considerable proportion of prolonged stays occurred during the night shift. Similar findings have been reported in other studies, where reduced staffing levels, limited access to diagnostic services, and delays in specialist consultations during nighttime hours were identified as potential contributors to longer ED stays (3, 22). These findings highlight the importance of appropriate staffing and resource allocation across all work shifts.

The need for diagnostic procedures and specialist consultations was also common among patients with prolonged ED stays. Several studies have reported that laboratory testing and imaging procedures can significantly increase ED LOS due to processing time and delays in clinical decision making (23, 24). Likewise, consultation processes may prolong patient stays, particularly in teaching hospitals where multiple clinical teams are involved in patient management (25, 26). Improving coordination

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between emergency physicians, diagnostic units, and consulting specialists could therefore help reduce delays and improve patient throughput.

Finally, approximately half of the patients in this study were ultimately admitted to hospital wards. Delays in transferring admitted patients from the ED to inpatient beds have been widely recognized as a major contributor to ED overcrowding and LOS (27-29). Limited bed availability and inefficient bed management systems may therefore play an important role in extending ED stays in many hospitals.

Overall, the findings of this study suggest that prolonged ED stays in this center are influenced not only by patient characteristics and clinical complexity but also by organizational and process related factors within the hospital. Addressing issues such as diagnostic turnaround time, consultation processes, and inpatient bed management may help reduce ED LOS and improve the efficiency of emergency care delivery.

Several methodological limitations merit consideration. First, the single-institution design restricts the external validity of our conclusions; nevertheless, the comprehensive nature of our dataset provided unique insights, and replication in diverse settings is recommended. Second, the retrospective chart-based approach may have introduced information bias due to incomplete documentation; we attempted to minimize this risk by using predefined data fields and conducting consistency checks, though some degree of missingness remains unavoidable. Third, we did not assess certain operational variables—namely staffing ratios, bed turnover, and real-time crowding indicators—which are known determinants of ED LOS; while this precludes causal inference regarding these factors, our findings highlight the need for future work that integrates real-time operational metrics to complement clinical data..

Conclusion

This study showed that prolonged ED LOS at Imam Khomeini Hospital in Urmia is mainly related to operational and process related factors rather than demographic characteristics alone. The findings indicate that night shift presentations, triage level 2 cases, the need for diagnostic procedures, and delays in specialist consultations were common features among patients experiencing prolonged stays. These results highlight the importance of improving patient flow processes within the ED. For Imam Khomeini Hospital, strengthening coordination with consulting services, improving diagnostic turnaround time, and optimizing staffing and resource availability during night shifts may help reduce prolonged ED stays. Implementing structured consultation protocols and faster diagnostic pathways could be practical strategies to improve ED efficiency and patient flow.

Ethics Approval and Consent to Participate

This study was derived from a general medical thesis conducted by Bita Soltanpour and was approved by the Ethics Committee of Urmia University of Medical Sciences, Urmia, Iran (Ethics code: IR.UMSU.HIMAM.REC.1403.130). As this was a retrospective study based on anonymized medical records from the ED, individual patient consent to participate was not required in accordance with institutional ethical guidelines..

Consent for Publication

As this study was conducted using retrospectively collected and anonymized medical records from the ED, no identifiable patient information was used. Therefore, individual informed consent for publication was not required. All data were handled in accordance with the ethical guidelines of Urmia University of Medical Sciences to ensure patient confidentiality.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Funding Statement

None.

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Author's Contribution

HR.M designed the study, supervised the research process, and was a major contributor to writing the manuscript. K.A. collected and organized the patient data from the ED records of Imam Khomeini Hospital. B.CHA performed the statistical analysis, including descriptive and inferential statistics, in consultation with a statistician. B.S contributed to the interpretation of the clinical and operational data related to ED LOS. HR.M also contributed to the literature review and drafting of the introduction and discussion sections. All authors read and approved the final manuscript.

Conflict of Interest

The authors declared no conflicts of interest

Declaration of Generative Artificial Intelligence in Scientific Writing

No generative artificial intelligence tools were used in the preparation or writing of this manuscript.

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